



Eighth Semester B.E. Degree Examination, June/July 2019
Mining Geo Statistics

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART - A

- 1 a. Provide a brief account on various schools of geostatistics. (06 Marks)
- b. Explain in detail polygonal method of ore reserve estimation. (04 Marks)
- c. Determine average grade and average thickness of an iron ore deposit based on the information in Fig.Q1(c) and Table.1 below : (10 Marks)

Area of triangle in m ²	Sample Points	Thickness in m	Grade (Fe %)
$\Delta A = 1300$	1	5.2	56
$\Delta B = 1100$	2	3.8	60
$\Delta C = 1200$	3	4.6	62
	4	5.1	64
	5	4.1	58

Table1: Thickness and Fe% at different sample points

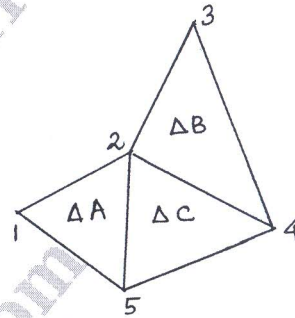
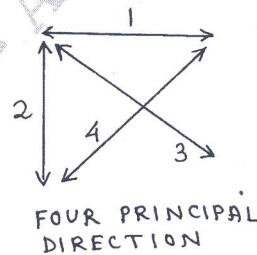
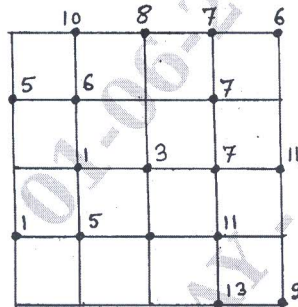


Fig.Q1(c): Relative position of samples

- 2 a. Define semi-variogram function. (02 Marks)
- b. Derive mathematical relation among semivariance, variance and covariance. (04 Marks)
- c. Provide a detailed account of various mathematical models of semi-variogram (14 Marks)
- 3 a. Explain in detail the characteristics of a semi-variogram fitted with spherical model. Illustrate your answer with neat sketch. (08 Marks)
- b. Following are the sample values obtained in a bedded deposit in grid form as shown in Fig.Q3(b). Each grid is of square shape calculate semi-variogram in four principal directions. Also calculate mean semi-variogram. (12 Marks)



- 4 Discuss in detailed the following:
 - a. Isotropy and Anisotropy.
 - b. Stationarity.
 - c. Regularization.
 - d. Nugget effect.

(20 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice

PART - B

- 5 a. Define Estimation variance and extension variance. (02 Marks)
 b. Derive an expression for estimation variance of a block by a sample. (08 Marks)
 c. Consider a point semi variogram $\gamma(h)$ linear for $h < 2$ and searching a sill $c = 1.0$ at $h = 2$. There is no nugget effect. A square block - V of size 3×3 is estimated by a point sample. S located at a corner of the square as shown in figure 5(c). Calculate estimation variance of the block. (10 Marks)

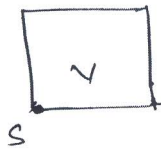
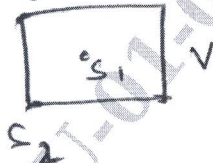


Fig.Q5(c) Square block v and sample s at corner

- 6 a. Derive an expression for kriged estimate and error for a block with two samples. (15 Marks)
 b. Following are the values for the configuration (fig. Q6(b)).



$$\begin{aligned} \bar{\gamma}(v, v) &= 0.60 (\%)^2 \\ \bar{\gamma}(s_1, v) &= 0.60 (\%)^2 \\ \bar{\gamma}(s_2, v) &= 0.80 (\%)^2 \\ \bar{\gamma}(s_1, s_2) &= \bar{\gamma}(s_2, s_1) = 0.90 (\%)^2 \end{aligned}$$

Fig. Q6(b)

$g_1 = 3\%$, $g_2 = 2\%$.

Notations used are having usual meaning. Calculate Kriged estimate of block V and the associated kriging variance. (05 Marks)

- 7 Describe in brief the following :
 a. Point kriging cross validation method. (06 Marks)
 b. Block kriging. (07 Marks)
 c. Grade - tonnage relation. (07 Marks)
- 8 Illustrate the following :
 a. Mis classified tonnages. (07 Marks)
 b. Grade control. (07 Marks)
 c. Geo statistical optimization of drilling. (06 Marks)
